

Resolution of the *Thelymitra aristata* (Orchidaceae) complex of south-eastern Australia

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Abstract

The seven currently known taxa in the *Thelymitra aristata* Lindl. complex are reviewed and descriptions are presented for each. *Thelymitra adorata* Jeanes and *Thelymitra kangaloonica* Jeanes from eastern New South Wales are described as new and illustrated. The key diagnostic features relating to the size and colour of the perianth, the shape of the post-anther lobe of the column, the presence or absence of auxiliary lobes, the density of the hairs on the lateral lobes and the placement of the anther are elucidated. Information on distribution, habitat, pollination biology, flowering time and conservation status is given for all seven taxa. The main distinguishing features of *Thelymitra aristata*, *Thelymitra epipactoides* F.Muell., *Thelymitra grandiflora* Fitzg., *Thelymitra planicola* Jeanes, *Thelymitra silena* D.L.Jones and the two new species are tabulated. A key is provided to distinguish all seven members of the *T. aristata* complex.

Keywords: sun orchids, taxonomy, diagnostic features

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Introduction

Thelymitra J.R.Forst. & G.Forst. is a complex genus of orchids consisting of about 100 described species, several described natural hybrids and at least 10 undescribed taxa. It is concentrated in higher rainfall areas of temperate Australia, but a few species occur in tropical north-eastern Australia, about 20 species occur in New Zealand (15 endemic) and a few species occur in Indonesia, New Caledonia, New Guinea and the Philippines.

This is one of a series of papers by the author reviewing the various morphologically distinct groups or complexes within *Thelymitra*. During the course of my studies of the *Thelymitra aristata* Lindl. complex it became evident that two undescribed species were present within the group. I take this opportunity to describe these new species and review the entire complex.

There are a number of morphological features that, in combination, distinguish members of the *Thelymitra aristata* complex from all other *Thelymitra* species. Plants are generally robust and fleshy with the inflorescence often 40–100 cm tall. The leaf and sterile bracts are also usually large and fleshy. The flowers are often numerous, large to moderately large, usually pale blue to deep blue but may be purplish or mauve (or pink, green, reddish or brownish in *Thelymitra epipactoides* F.Muell.), scented or unscented. The column has a well-developed post-anther lobe that may be more or less rectangular and strap-like or with the lateral margins variously recurved. Auxiliary lobes are absent, except in *T. epipactoides*. The lateral lobes are well-developed (except in *T. silena*) with dense terminal tufts of white hairs (sparse or absent in *T. silena*). The anther may be basal or produced about half way along the column at anthesis. Although the flowers are generally large for the genus and open fairly freely in warm weather some species are apparently insect-pollinated while others are facultatively autogamous.

Taxonomic history and discussion

Historically there has been significant confusion about the correct application of names and the interpretation of species within the

T. aristata complex, most notably with *T. aristata* itself. This confusion persisted for more than 100 years and has revealed itself in the many floras and orchid books published during that time. It was only relatively recently, following the study of the type material, that the correct application of names was finally achieved.

The first species in the group to be recognised, *T. aristata*, was described by Lindley (1840) from two R. Gunn collections from far north-western Tasmania. The type specimens are accompanied by a very rudimentary line drawing, apparently executed by Lindley, of a column in profile, which unfortunately gives the impression of a tubular post-anther lobe.

Lindley's Latin diagnosis does not help to establish the morphology of the post-anther lobe although he clearly knew it differed from that of members of the *Thelymitra nuda* R.Br. and *Thelymitra pauciflora* R.Br. complexes as species belonging to these are listed separately in his publication. Hooker (1858) reduced *T. aristata* to synonymy under Robert Brown's *Thelymitra angustifolia* R.Br., probably as a result of his misinterpretation of the latter species or of the Lindley sketch on the type sheet of *T. aristata*. Mueller (1866) described *T. epipactoides* based on two fragmentary specimens collected by C. French junior from the Port Phillip region of Victoria. He compared his new species to *Thelymitra canaliculata*

Table 1. Taxonomic history of the *T. aristata* complex showing the names used by various authors for the seven taxa recognised in the current treatment.

Author	Name used						
Lindley (1840)	<i>T. aristata</i>	n/a	n/a	n/a	n/a	n/a	n/a
Hooker (1858)	<i>T. angustifolia</i>	n/a	n/a	n/a	n/a	n/a	n/a
Mueller (1866)	<i>T. aristata</i>	<i>T. epipactoides</i>	n/a	n/a	n/a	n/a	n/a
*Bentham (1873)	none	<i>T. ixioides</i> or <i>T. conolicutoto</i>	n/a	n/a	n/a	n/a	n/a
*Mueller (1882)	none	none	n/a	n/a	n/a	n/a	n/a
Fitzgerald (1882)	none	none	<i>T. grandiflora</i>	n/a	n/a	n/a	n/a
*Mueller (1886)	none	<i>T. epipactoides</i>	nane	n/a	n/a	n/a	n/a
*Fitzgerald (1875–1894)	nane	<i>T. epipactoides</i>	<i>T. grandiflora</i>	n/a	n/a	n/a	n/a
*Ewart (1930)	<i>T. grandiflora</i> p.p.	<i>T. epipactoides</i>	<i>T. grandiflora</i> p.p.	n/a	n/a	n/a	n/a
Nicholls (1934)	<i>T. murdochae</i> <i>T. grandiflora</i>	nane	none	n/a	n/a	n/a	n/a
*Black (1943)	<i>T. grandiflora</i> p.p.	<i>T. epipactoides</i>	<i>T. grandiflora</i> p.p.	n/a	n/a	n/a	n/a
*Willis (1962)	<i>T. grandiflora</i> p.p.	<i>T. epipactoides</i>	<i>T. grandiflora</i> p.p.	n/a	n/a	n/a	n/a
*Nicholls (1969)	<i>T. murdochae</i> <i>T. grandiflora</i> p.p.	<i>T. epipactoides</i>	<i>T. grandiflora</i> p.p.	n/a	n/a	n/a	n/a
George (1971)	<i>T. oristota</i>	none	<i>T. oristota</i>	n/a	n/a	n/a	n/a
Jones (1988)	<i>T. aristata</i>	<i>T. epipactoides</i>	<i>T. oristota</i>	n/a	n/a	n/a	n/a
Clements (1989)	<i>T. aristata</i>	<i>T. epipactoides</i>	<i>T. oristota</i>	n/a	n/a	n/a	n/a
Bates & Weber (1990)	<i>T. oristota</i>	<i>T. epipactoides</i>	<i>T. oristota</i>	n/a	n/a	n/a	n/a
Weber & Entwistle (1994)	<i>T. oristota</i>	<i>T. epipactoides</i>	<i>T. grandiflora</i>	n/a	n/a	n/a	n/a
Backhouse & Jeanes (1995)	<i>T. oristota</i>	<i>T. epipactoides</i>	<i>T. oristota</i>	n/a	n/a	n/a	n/a
Jones (1999)	<i>T. oristota</i>	none	<i>T. grandiflora</i>	<i>T. sileno</i>	n/a	n/a	n/a
Bishop (2000)	<i>T. oristota</i>	<i>T. epipactoides</i>	nane	none	n/a	n/a	n/a
Janes (2006)	<i>T. oristota</i>	<i>T. epipactoides</i>	<i>T. grandiflora</i>	<i>T. sileno</i>	<i>T. planicala</i>	<i>T. adarota</i> ms	<i>T. kangaloonica</i> ms
Jeanes (this paper)	<i>T. oristota</i>	<i>T. epipactoides</i>	<i>T. grandiflora</i>	<i>T. silena</i>	<i>T. planicola</i>	<i>T. adarota</i>	<i>T. kangaloonica</i>

*The name *T. aristata* is used in the publication but is incorrectly applied to taxa outside this complex

Table 2. Various features of species in the *T. aristata* complex.

	<i>T. aristata</i>	<i>T. epipactoides</i>	<i>T. grandiflora</i>	<i>T. silena</i>	<i>T. adarata</i>	<i>T. kangalbanicaa</i>	<i>T. planicula</i>
Height of inflorescence (cm)	20–100	20–50	20–80(–100)	20–55	20–60	20–56	22–45
Number of sterile bracts	1–4	1 or 2	2–4	usually 2	2–4	2–3	2–4
Number of flowers per inflorescence	2–40	6–25	2–30	3–15	2–13	2–15	2–12
Usual colour of flowers	blue to violet	pink, bronze, green, blue or reddish	blue, lilac, mauve or pale purplish, rarely pink,	pale blue	dark blue	dark blue with darker longitudinal veins	medium blue with darker blue longitudinal veins
Length of sepals (mm)	10–25	12–20	8–20	10–19	8–13	8–18	7–15
Shape of post-anther lobe extension	flat to curved and strap-like	more or less flat and strap-like	straight to curved, strap-like, base thick, lateral margins often decurved	more or less globose, apex deeply bilobed, lobes irregularly toothed	curved, more or less semicylindric, apex notched, distal margin irregularly toothed, incurved	curved, more or less flat, strap-like, apex notched, distal margin toothed or incised;	curved, more or less semicylindric, apex shallowly bilobed, distal margin irregularly toothed
Auxiliary lobes of column	absent	present	absent	absent	absent	absent	absent
Length of lateral lobes of column (mm)	1.5–2.5	1–1.5	1.5–2.5	0–1	1.5–2	1.5–2.3	1.2–2
Hairs on lateral lobes of column	dense, more or less terminal	dense, toothbrush-like	dense, more or less terminal	sparse, more or less terminal, or absent	dense, more or less terminal	dense, more or less terminal	dense, more or less terminal
Length of post-anther lobe extension (mm)	1.5–2.5	1–2	2–2.5	2–2.5	1–1.5	1.5–2	0.5–1.2
Anther position at anthesis	basal	basal	basal	mid-way along column	mid-way along column	basal	mid-way along column
Flower scent	present	none reported	present	none reported	none reported	present	none reported
Primary pollination mechanism	entomophily	entomophily	entomophily	autogamy	autogamy	autogamy	autogamy

R.Br. and *Thelymitra media* R.Br. apparently due to the presence of auxiliary lobes on the column. Mueller (1866) also compared the habit of his new species with that of *T. aristata* suggesting that his interpretation of the latter may have been correct. Benthams (1873) recognised *T. aristata* as distinct, but his interpretation of the species appears to have been similar to that of Hooker rather than that of Lindley as he compared it to *Thelymitra longifolia* J.R.Forst. & G.Forst. and *Thelymitra macrophylla* Lindl., both of which belong to a different group. He also attributed it to Western Australia, but it is now known to be confined to eastern Australia. Until very recently most authors followed Hooker or Benthams by erroneously interpreting *T. aristata* as belonging to either the *T. pauciflora* or the *T. nuda* complexes, taxa with a strongly tubular post-anther lobe on the column. Benthams (1873) also did not recognise *T. epipactoides* as distinct, but suggested that it may be a variety of *Thelymitra ixioides* Sw. or *T. canaliculata* probably due to the presence of auxiliary lobes on the columns of those species. Mueller (1882) followed Benthams (1873) in not recognising his own *T. epipactoides*, but later (Mueller 1886) he again recognised *T. epipactoides* as distinct. Fitzgerald (1882) described *Thelymitra grandiflora* Fitzg. from three specimens that he collected in the Mount Lofty Ranges in South Australia. This was soon to become the accepted name for plants from south-eastern Australia with a more or less strap-like post-anther lobe on the column (i.e. Lindleys *T. aristata*). Nicholls (1934) described *Thelymitra murchisoniae* Nicholls apparently from a single specimen discovered by E.H. Homann near Wonthaggi in Victoria, a taxon later recognised as a teratological form of *T. aristata*. Nicholls (in Black 1943) reduced *Thelymitra megalyptra* Fitzg. to varietal rank under *T. aristata* (i.e. *Thelymitra aristata* var. *megalyptra*) thereby increasing the confusion regarding the true identity of *T. aristata*.

Following his study of the type specimens, George (1971), was probably the first person in nearly 100 years to use the correct application of the name *T. aristata* to the robust species with the strap like post-anther lobe from south-eastern Australia. George (1971) also reduced *T. grandiflora* to synonymy under *T. aristata*. Clements (1989) followed George (1971) in the application of the name *T. aristata* and he also relegated *T. grandiflora* and *T. murchisoniae* to synonymy thereunder.

Jones (1999) described *Thelymitra silena* D.L.Jones from Clarke Island in Bass Strait, a species later found in several other locations on mainland Tasmania as well as on South Bruny Island. In my original description of *Thelymitra planicola* Jeanes (Jeanes 2000) I commented on the difficulty in placing this species due to the intermediate morphology of the post-anther lobe between those of *T. aristata* and *T. pauciflora* sens. lat. Later (Jeanes 2004) I included *T. planicola* in my treatment of the *T. pauciflora* complex with some uncertainty, and I now believe that it is better placed in the *T. aristata* complex (for an explanation see comments under *T. planicola* below). Jones (2006) for the first time described and circumscribed correctly all seven species in the complex including informal descriptions of *Thelymitra adorata* Jeanes and *Thelymitra kangaloonica* Jeanes, two new species from New South Wales whose names are validated in this paper.

Explanation of the terminology used

The genus *Thelymitra* is unusual in the Orchidaceae in that the six perianth segments generally differ very little from each other in terms of size, shape and ornamentation. The labellum does not bear any hairs, calli, glands, ridges, lobes, teeth or fringes and is apparently not involved in pollination. Since the perianth is virtually actinomorphic and generally lacks characters by which to distinguish the species, traditionally the structure of the column has supplied most of these distinguishing characters. Over the years a terminology has evolved to describe the column structure in *Thelymitra*, but some of these terms are poorly understood and some have never been defined adequately. Below is an explanation of some of the terms commonly used in this paper; most have a traditional usage, although this has often not been well understood.

Column (gynostemium): The column is exposed in the centre of the flower, it lacks a free filament and style, is short and thick and broadly winged from below the stigma to the level of the anther or beyond. The apex is usually 3–5-lobed and is often ornamented with hairs, fringes, teeth, calli, glands, tubercles or lobes. In members of the *T. aristata* complex the apex of the column extends well beyond the point of insertion of the lateral lobes into a well-developed post-anther lobe.

Post-anther lobe (mid-lobe): This structure protrudes

beyond the point of insertion of the anther and of the lateral lobes, and it is usually of a different colour to the rest of the column. It has a complex vascular supply always associated with that of the functional anther and may be regarded as an outgrowth of the filament. In some species it is represented only by a short flap or a band of small calli crowded across the back of the anther. In most species it extends well beyond the anther with a free margin that may be plain, undulate, toothed, notched or variously ornamented with tubercles. At its maximum development it forms a fleshy, tubular hood that is variously open on the ventral side and overhangs and obscures the anther. In the *T. aristata* complex the post-anther lobe is well-developed and may be relatively flat and strap-like or have the lateral margins variously recurved. The apex is often irregularly toothed and notched in the middle and the distal margin may be flat or recurved.

Post-anther lobe extension: This term is used herein for the region of the post-anther lobe that extends beyond the point of insertion of the lateral lobes. The size and shape varies considerably from taxon to taxon and is very useful in helping to define species.

Lateral lobes (column-arms or lateral staminodes): These two structures are inserted one on each side of the post-anther lobe and extend forward or upward and often converge. They are each supplied by a single unbranched vascular bundle and are thought to represent staminodes. They may be flat and ribbon-like, terete and finger-like, straight, curved, twisted spirally or bent sharply, and are usually ornamented with lobes, teeth, tubercles or hairs. The lateral lobes are generally flat and more or less straight in members of the *T. aristata* complex, and each is terminated by a dense mop-like tuft of white hairs. *Thelymitra silena* may completely lack lateral lobes and/or hair tufts or these may be much reduced.

Auxiliary lobes (accessory lobes or side lobules): Several species of *Thelymitra* have a pair of distinct lobes between the post-anther lobe and the lateral lobes. These have no vascular strand and are most accurately described as being part of a tripartite post-anther lobe. They tend to be fleshy with irregularly jagged margins and sometimes have small surface tubercles. In the *T. aristata* complex they are only present in *T. epipactoides* and are strap-like, often strongly incurved and irregularly toothed at the apex.

Anther: In *Thelymitra*, the anther is usually small, ovoid, and situated entirely between the column wings. The connective extends beyond the pollinia into an apical beak-like projection of varying size. The anther may be entirely above the stigma or variously obscured behind it. In the *T. aristata* complex the anther may be inserted basally behind the stigma or about half way along the column at anthesis. The anther beak is small and insignificant.

Pollinia: Members of the genus *Thelymitra* contain four pollinia in two groups of two. In the *T. aristata* complex the pollen grains may be tightly bound with the pollinarium being removed by insects as a single unit, or in some species the pollen is friable leading to autogamy.

Stigma: The stigma in *Thelymitra* is more or less bilobed at the apex, usually quadrate or transverse-elliptic in shape and located at the base of the column on a thick stalk.

Materials and Methods

This paper is the result of a qualitative and quantitative study of the pertinent type material (or photographic reproductions thereof), hundreds of herbarium specimens (both dry and spirit-preserved) from AD, BM, BRI, CANB, E, HO, MEL, NSW, P, PERTH, QRS, SUNIV and WELT, and numerous freshly collected specimens, all of which were vouchered and deposited at the relevant herbaria. Orchid taxa in general, and *Thelymitra* taxa in particular, are much more readily identified from fresh living material where characters of the perianth, the column, flower colour and fragrance are still intact. Familiarity with the taxa gained from field study and the study of freshly collected specimens sent to me by field operatives has made the identification of dried and spirit-preserved herbarium material (including type specimens) much easier.

When collecting *Thelymitra* for study it is essential that the entire above ground parts of the plant be taken, with the majority of the material being preserved in spirit. Plants preserved in the pressed state are often difficult to identify to species level in the absence of additional information. Spirit preserved specimens on the other hand, are generally much more easily identified to species level. The observation of plants growing *in-situ* is the ideal method of study for *Thelymitra* in general, and

often it is only by this method that cryptic new species can be identified. For this reason the importance of field work in the study of species complexes within *Thelymitra* cannot be overstated and should form an integral part of any future studies of the group. It is possible that other taxa worthy of recognition exist within this complex, but adequate information and collections of these are lacking at present.

Taxonomy

1. *Thelymitra epipactoides* F. Muell., *Fragm.* 5: 174 (1866).

Type: Port Phillip, C. French jun. s.n. (lectotype MEL 677565!, spirit MEL2039616!, *hic designatus*).

Illustrations: Nicholls (1969) plate 35; Bates & Weber (1990) plates 206 & 207; Backhouse & Jeanes (1995) page 338; Bishop (2000) plate 51; Jeanes & Backhouse (2006) page 198; Jones (2006) page 239.

Glabrous terrestrial herb. Tubers ovoid, 1–3 cm long, 5–15 mm wide, fleshy. Leaf linear-lanceolate to lanceolate, 18–30 cm long, 14–30 mm wide, erect, canaliculate, fleshy, dark green with a reddish base, ribbed abaxially, sheathing at base, apex acuminate. Inflorescence 20–50 cm tall. Scape 2–6 mm diam., stout, straight, green or purplish. Sterile bracts 1 or 2, linear-lanceolate to lanceolate, 5–14 cm long, 5–25 mm wide, leaf-like, green to purplish, closely sheathing at base, acuminate. Fertile bracts ovate-acuminate to obovate-acuminate, 2–5 cm long, 4–9 mm wide, sheathing the pedicels, green to purplish. Pedicels 4–20 mm long, slender. Ovary cylindric to narrow-obovoid, 6–14 mm long, 1.5–4 mm wide. Flowers 6–25, 25–42 mm across, pink, bronze, green, blue or reddish, often with a coppery sheen, opening freely in warm weather. Perianth segments 12–20 mm long, 4–10 mm wide, thick-textured, concave, often shortly apiculate; dorsal sepal ovate, obtuse to subacute; lateral sepals ovate

Key to the known members of the *T. aristata* complex.

- 1 A prominent pair of auxiliary lobes present between the post-anther lobe and the lateral lobes of the column 1. *T. epipactoides*
- 1: Auxiliary lobes absent 2
- 2 Anther inserted well above base of column at anthesis, not or only partially obscured behind the stigma 3
- 2: Anther inserted at base of column at anthesis, mostly obscured behind the stigma 5
- 3 Lateral lobes of column often poorly developed or absent, if present then hairs sparse or absent; post-anther lobe of column sub-globose; flowers pale blue; Tasmania 2. *T. silena*
- 3: Lateral lobes of column well-developed, each with a dense terminal tuft of hairs; post-anther lobe of column semi-cylindric; flowers deep blue; New South Wales and Victoria 4
- 4 Post-anther lobe of column deeply and narrowly lobed or split at the apex; plants not noticeably glaucous; New South Wales near Gosford 5. *T. odorato*
- 4: Post-anther lobe of column not as above; plants glaucous; eastern Victoria and New South Wales between Nowra and Sydney 7. *T. planicola*
- 5 Perianth segments <20 mm long; flowers opening tardily; plant moderately robust, to 56 cm tall; habitat moderately high altitude sedge-swamp margins; New South Wales 6. *T. kongoloonica*
- 5: Perianth segments >20 mm long for at least some flowers in larger individuals; flowers opening freely; plants often very robust, to 100 cm tall; habitat low to moderately high altitude heathlands and heathy woodlands; south-eastern Australia 6
- 6 Post-anther lobe of column more or less flat, not thickened at base, lateral margins not, or only slightly recurved; south-eastern Australia 3. *T. aristata*
- 6: Post-anther lobe of column thickened at the base, lateral margins often strongly recurved; South Australia 4. *T. grandiflora*

to ovate-lanceolate, often slightly asymmetric, acute; *petals* ovate, obtuse to acute; *labellum* ovate to ovate-lanceolate, often narrower than other segments, acute to obtuse. *Column* erect from the end of ovary, 5–8 mm long, 2.3–4.5 mm wide, same colour as perianth but often paler; *post-anther lobe* not hooding the anther, 2–3 mm long, 1–1.5 mm wide; *post-anther lobe extension* 1–2 mm long, more or less flat, strap-like, gently incurved, reddish brown, often with a narrow purplish collar, apex irregularly toothed, yellow; *auxiliary lobes* usually incurved and often interlocking, 1–1.7 mm long, 0.7–1.5 mm wide, more or less flat, strap-like, base reddish brown, apex irregularly toothed, yellow; *lateral lobes* converging, 1–1.5 mm long, digitiform, obliquely erect, each with a toothbrush-like arrangement of white

hairs along most of their length, the individual hairs 1–2 mm long. *Anther* inserted at base of column, mostly obscured behind stigma, ovate, 3.5–4.5 mm long, 2–2.5 mm wide, connective produced into a beak 0.5–1 mm long; *pollinarium* c. 3.5 mm long; *viscidium* more or less round, c. 0.5 mm diam.; *pollinia* coherent, white. *Stigma* situated at base of column, ovate-quadrate, c. 2.5 mm long, c. 2.5 mm wide, margins irregular. *Capsules* obovoid, 13–18 mm long, 5–7 mm wide, erect, ribbed. (Fig. 1 a, Fig. 5 a–c)

Selected specimens examined: SOUTH AUSTRALIA: c. 2 miles E of Tintinara, beside main highway, 28.ix.1961, J.H. Willis s.n. (MEL 221702); Eyre Peninsula District: c. 3 km N of Wangary, adjacent to Duck Lake, 28.ix.1986, M.A. Clements 4290 (CANB 8605435); Killanoola, 3.x.1964, D. Hunt 2152 (AD DH2152);



Figure 1.
a. *Thelymitra epipactoides*;
b. *Thelymitra silena*;
c. *Thelymitra aristata*;
d. *Thelymitra grandiflora*.
 (photographs a–c. Jeff Jeanes, RBG Melbourne; d. Mark Clements, CSIRO Canberra)

South-east District, ix.1991, (AD 290595); Yorke Peninsula District: Port Vincent, 28.viii.1976, *R.J. Bates s.n.* (AD RJ8YP); Coonalpyn, 1.ix.2001, *K. Alcock JAJ1020* (MEL 2143258); South-east District: Big Heath National Park; Red Gum Flat, 4.xi.1969, *C.R. Alcock 2977* (AD 97005169); South-east District: Mt Scott Conservation Park, 7.x.1989, *R.J. Bates 21000* (AD 98943259); South-east District: Land being cleared near Mt Boothby, 21.ix.1983, *R.J. Bates 3419* (AD 98407204); South-east District: Yallum, c. 13 km W of Penola, 11.x.1963, *A.C. Beauglehole 18668* (AD 97307025). **VICTORIA:** 6 miles S of Poolaligelo, E side of Dergholm Road, 9.xi.1964, *A.C. Beauglehole 18678* (MEL 221703); Nirranda, c. 20 miles SE of Warrnambool, x.1958, *A.C. Beauglehole 18631* (MEL 221705); Little Desert, Kiata, 9.x.1960, *A.C. Beauglehole 18713* (MEL 221704); 16 km. SSW of Casterton, 16.x.1980, *C. Beardsell s.n.* (MEL 584669); Ararat, x.1932, ?*L. Banfield s.n.* (MEL 573513); Ararat, 17.x.1932, *L. Banfield s.n.* (MEL 625353); Ararat, x.1933, *Lang s.n.* (MEL 651011); Gippsland Lakes Coastal Park, 27.x.1983, *A.C. Beauglehole 74B31 & W.R. Beauglehole* (MEL 1531717); Sandringham, xii.1900, ?*C. French jun. s.n.* (MEL 573514); Sandringham, x.1900, *C. French jun. s.n.* & *C. Walter s.n.* (CANB 367952); Near Fyans Lake, N of Pomonal, 12.x.1947, *Robson s.n.* (MEL 1550425); Wilkin, c. 12 miles W of Casterton, 25.x.1961, *C.N. Austin s.n.* (MEL 1532689).

Distribution and habitat: South Australia and Victoria. Grows mostly in coastal heathland, grassland and woodland but extending further inland into similar habitats in the western part of its range. Substrates may be moist or dry sandy soils. Altitude: 0–200 m. (Fig. 2 a)

Conservation status: Widespread but of very sporadic occurrence and apparently in serious decline. Suggest 3E by criteria of Briggs and Leigh (1996) and Endangered (E) by criteria of IUCN (2001).

Flowering period: September to November.

Pollination biology: This species is entomophilous.

Typification: The type sheet contains several fragments, apparently belonging to two individual specimens (A and B), and a single label. The specimens are reasonably well-preserved and are of a single species. This sheet is here designated as the Lectotype. A single flower removed by J.Z. Weber, softened and placed in spirit, has been illustrated as a line drawing. This illustration has been attached to the sheet with the Lectotype.

Notes: *Thelymitra epipactoides* is a very distinctive species, not likely to be confused with any others. It is related to *T. aristata* as suggested by its robust habit, large leaf and bracts, strap-like post-anther lobe and the anther inserted at the base of the column. However, the presence of well-developed auxiliary lobes is unique

for the group. An old collection reputed to be from Bulli (New South Wales) has probably been mislabelled.

2. *Thelymitra silena* D.L.Jones, *Orchadian* 12(11): 518 (1999).

Type: Tasmania, Clarke Island, flat at foot of Green Hill, 12 xi. 1998, *J.E. Wapstra ORG1810 & A. Wapstra* (holotype CANB!, isotypes AD!, HO, MEL2089288!).

Illustrations: Jones (1999) page 525; Jones *et al.* (1999) pages 261 & 285; Bates (1999) page 72 (as *Thelymitra* sp. aff. *aristata*); Jones (2006) page 240.

Glabrous terrestrial *herb*, solitary or in small groups. *Tubers* obloid, 1–4 cm long, 6–15 mm wide, fleshy. *Leaf* linear to lanceolate, 10–35 cm long, 9–35 mm wide, erect, canaliculate, thick and fleshy, yellowish-green to green with a purplish base, ribbed abaxially, sheathing at base, apex acute. *Inflorescence* 20–55 cm tall. *Scape* 2.5–10 mm diam., slender to stout, straight, green or purplish. *Sterile bracts* usually 2, linear-lanceolate to lanceolate, 2.5–12 cm long, 5–22 mm wide, closely sheathing, green or purplish, acute to acuminate, apex often uncinat. *Fertile bracts* ovate-acuminate to obovate-acuminate, 8–35 mm long, 4–12 mm wide, closely sheathing the pedicel, green or purplish. *Pedicels* 3–10 mm long, slender. *Ovary* cylindric to narrowly obovoid, 8–14 mm long, 2.5–4 mm wide. *Flowers* 3–15, 23–38 mm across, pale blue, often campanulate, opening tardily in hot weather. *Perianth segments* 10–19 mm long, 6–14 mm wide, concave, often shortly apiculate; *dorsal sepal* obovate to oblanceolate, obtuse to subacute; *lateral sepals* obovate to oblanceolate, slightly asymmetric, subacute; *petals* obovate, obtuse to subacute; *labellum* obovate to oblanceolate, obtuse to acute. *Column* erect from the end of ovary, 7–9 mm long, 4–5.5 mm wide, cream to white; *post-anther lobe* hooding the anther, 2–3 mm long, 1.5–2.2 mm wide, pale brown grading to yellow; *post-anther lobe extension* 2–2.5 mm long, globose, apex deeply bilobed, lobes irregularly toothed, sometimes with a terminal spur, yellow; *auxiliary lobes* absent; *lateral lobes* converging, variable, 0–1 mm long, oblong to triangular or absent, obliquely erect, each with a sparse, terminal, mop-like tuft of white hairs, the individual hairs 0.4–1.1 mm long, or hairs absent. *Anther* inserted c. mid-way along column, ovoid, 2.3–2.8 mm long, 1.5–2.2 mm wide,

warty, connective produced into a short obtuse beak to 0.5 mm long; *pollinarium* 2.1–2.5 mm long; *viscidium* abortive; *pollinia* friable, mealy, white. *Stigma* situated at base of column, ovate-quadrate, c. 2 mm long, c. 3 mm wide, somewhat vestigial, margins irregular. *Capsules* obovoid, 14–20 mm long, 5–12 mm wide, erect, ribbed, slightly pruinose. (Fig. 1 b, Fig. 5 d–f)

Selected specimens examined: TASMANIA: Clarke Island. Lower southern slope of Steep Hill, 1.xi.1982, *J.S. Whinray* 5141 (HO 328791 & MEL 2045893); Clarke Island. East of Maclaines Creek, 31.x.1982, *J.S. Whinray* 5079 (MEL 2047683); Clarke Island. Lower southern slope of Steep Hill, 1.xi.1982, *J.S. Whinray* 5140 (MEL 2045885); Clarke Island. Near Sandy Lagoon, 12.xi.1979, *J.S. Whinray* 2327 (MEL 594275); Clarke Island. Maclaines Bay, 11.xi.1979, *J.S. Whinray* 2311 (MEL 594274); Clarke Island, xi.1895, *L. Rodway* s.n. (MEL 1532073); Clarke Island. Flat south of Sandy Lagoon, 16.xi.1979, *J.S. Whinray* 2520 (CAN8 340259); Scamander Coastal Reserve, 31.x.1987, *R.J. Bates* s.n. (AD 98746495); 8icheno, 13.x.1988, *R.J. Bates* s.n. (AD RJ8TAS); Ridgeway Park, Ridgeway, 26.xi.2000, *H. Wapstra* JAJ795 (MEL 2087461 & MEL 2089298); Mt Nelson near Hobart, x.1920,

H.M.R. Rupp 425 (NSW 190568); N slope of Mt Brown, Tasman Peninsula, 21.xi.2003, *A.Gray* 1313 (HO).

Distribution and habitat: Apparently endemic to Tasmania where known only from Clarke Island (Furieux Group) in Bass Strait, Bridport, Scamander, South Bruny Island, Mt Brown on the Tasman Peninsula and Hobart. On Clarke Island it grows in sedgeland dominated by *Gahnia* tussocks with scattered shrubs. Elsewhere it grows in heathy woodland. Soils are sandy or peaty loams. Altitude 10–50 m. (Fig. 2 b)

Conservation status: Of very sporadic occurrence but sometimes locally common and conserved. Suggest 2RC by criteria of Briggs and Leigh (1996) and Rare (R) by criteria of IUCN (2001).

Flowering period: October to November

Pollination biology: The tardily opening flowers, vestigial lateral lobes on the column, abortive viscidium, friable, mealy pollen, vestigial stigma and the high incidence of seed pod development would suggest that this species is probably autogamous.

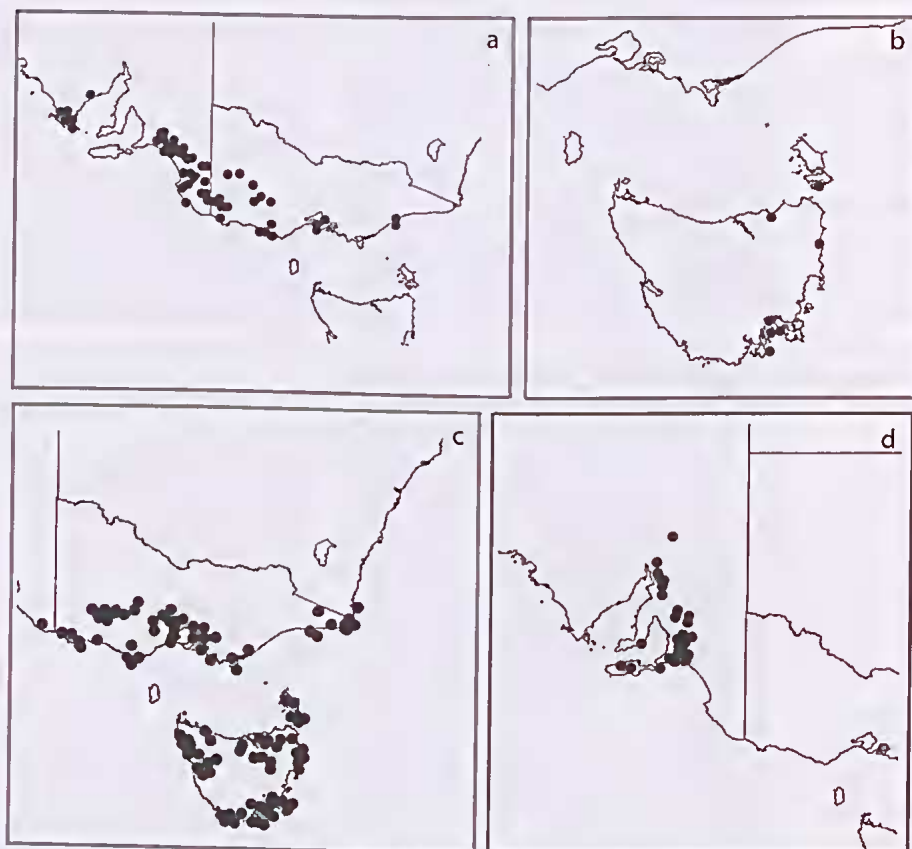


Figure 2a. Distribution of: a. *Thelymitra epipactoides*; b. *Thelymitra silena*; c. *Thelymitra aristata*; d. *Thelymitra grandiflora*.

Notes: On Clarke Island, *T. silena* grows sympatrically with *T. aristata* and the two are obviously closely related. The latter can be readily distinguished by its darker blue flowers that open more readily, its more or less flat, strap-like post-anther lobe on the column, longer lateral lobes with many hairs in dense tufts and a more basal anther. The South Australian species *T. grandiflora* is also related to *T. silena*, but the former has darker blue, pale purplish to lilac flowers, a less globose post-anther lobe, longer lateral lobes with many more hairs and a more basal anther.

L. Rodway collected *T. silena* on Clarke Island in late November 1895, and sent a specimen to Baron Ferdinand von Mueller in Melbourne. The specimen was accompanied by the note "The enclosed *Thelymitra* from Clarke Island has a total absence of lateral lobes to the column wing. Otherwise it does not differ from robust forms of *T. aristata* Lind. The short anther and papillose termination to the column wing being exactly in accord. I thought it might interest you. I will endeavour to find out if it is a mere sport next season." At the time of collection the specimen was past anthesis and had splitting seed capsules. By the time the plants flowered again in the following season, Mueller was probably already dead, and there is no evidence that Rodway returned to Clarke Island to collect more specimens as he had intended. The species was apparently not collected again until November 1979, by J.S. Whinray.

A collection of this species, housed at AD, reputedly originating from Wilsons Promontory in Victoria is in need of confirmation.

3. *Thelymitra aristata* Lindl., *Gen. Sp. Orch. Pl.* 521 (1840).

Type: Tasmania, Welcome River near Woolnorth, xi. 1837, *R. Gunn* 939 (lectotype K!); *Residual syntypes:* Tasmania, Circular Head, xii. 1837, *R. Gunn* 941 (BM!, K!, PI!).

Thelymitra murchisoniae Nicholls, *Victorian Naturalist* 50: 219, t. 35 (1934). **Type:** Victoria, Wonthaggi, 7 xi. 1933, E.H. Homann s.n. (holotype MEL651736!, MEL2039622!). (as *T. Murchisoniae*)

Illustrations: Nicholls (1969) plates 33 & 34 (as *T. grandiflora*); Jones (1988) pages 286, 288 & 289; Bates & Weber (1990) plate 198; Weber & Entwistle (1994) fig. 179 a–c; Backhouse & Jeanes (1995) page 330; Jones et

al. (1999) pages 260 & 265; Jeanes & Backhouse (2006) page 199; Jones (2006) 239.

Glabrous terrestrial *herb*. *Tubers* ovoid, 1–4 cm long, 5–20 mm wide, fleshy. *Leaf* linear to linear-lanceolate, 10–40 cm long, 5–40 mm wide, erect, canaliculate, fleshy, dark or light green with a purplish base, ribbed abaxially, sheathing at base, apex acute. *Inflorescence* 20–100 cm tall. *Scape* 2–9 mm diam., slender to stout, straight, green or purplish. *Sterile bracts* 1–4, linear to lanceolate, 3–15 cm long, 5–25 mm wide, closely sheathing, dark green with a purplish base, acute, lower ones leaf-like. *Fertile bracts* ovate-acuminate to obovate-acuminate, 7–35 mm long, 3–10 mm wide, closely sheathing the pedicel, green or purplish. *Pedicels* 4–25 mm long, slender. *Ovary* cylindric to narrowly obovoid, 8–20 mm long, 2–5 mm wide. *Flowers* 2–40, 15–45 mm across, usually blue to violet, opening moderately freely in warm weather. *Perianth segments* 10–25 mm long, 4–10 mm wide, concave to almost flat, shortly apiculate; *dorsal sepal* ovate to lanceolate, acute; *lateral sepals* ovate to lanceolate, acute; *petals* ovate to lanceolate, acute; *labellum* ovate to lanceolate, acute, often narrow than other segments. *Column* erect from the end of ovary, 5.5–8 mm long, 2–3.5 mm wide, white, pale blue or greenish; *post-anther lobe* not hooding the anther, 2–3 mm long, 1.5–2.2 mm wide; *post-anther lobe extension* 1.5–2.5 mm long, more or less flat, strap-like, straight or gently curved, apex often shallowly bilobed, lobes toothed or incised, yellow with a dark purplish collar; *auxiliary lobes* absent; *lateral lobes* converging, 1.5–2.5 mm long, digitiform, obliquely erect, each with a more or less terminal short toothbrush-like tuft of white to pale yellow hairs, the individual hairs 1–1.7 mm long. *Anther* inserted at base of column, mostly obscured behind stigma, ovoid to almost spherical, 1.8–2.6 mm long, 1.4–2.2 mm wide, warty, connective produced into an obtuse beak to c. 0.4 mm long; *pollinarium* 1.4–2.2 mm long; *viscidium* circular to reniform, c. 0.5 mm long; *pollinia* coherent, white. *Stigma* situated at base of column, ovate-quadrate, 1.5–2.5 mm long, 1.5–2.5 mm wide, margins irregular. *Capsules* obovoid, 10–20 mm long, 5–6 mm wide, erect, ribbed. (Fig. 1 c, Fig. 5 g–i)

Selected specimens examined: SOUTH AUSTRALIA: South East: Mt Burr, 11.x.1973, R.J. Bates s.n. (AD 97722494). **NEW SOUTH WALES:** Roadside near Eden, 4.x.1987, R.J. Bates 10535

(AD 98741369). **VICTORIA:** Mornington Peninsula. Stony Point, about 1 km north-west of railway station, 29.x.1971, *T.B. Muir* 5036 (MEL 533510); Gippsland. Southern boundary of Marlo Aerodrome, 7 km E of Marlo, 7.x.1973, *T.B. Muir* 5170 (MEL 221673); Little Ti-tree Creek, between Cavendish & Victoria Range South, 19.xi.1968, *A.H. Corrick* s.n. (MEL 665158); Pyrete Range, xi.1932, *G. Lyell* s.n. (MEL 573899); Creswick, x.1973, *F. Luke* s.n. (MEL 538347); Ararat, x.1933, ?*L. Banfield* s.n. (MEL 573517); Creswick, 11.xi.1928, *J.H. Willis* s.n. (MEL 577250); Blackwood, x.1938, *G. Mayer* s.n. (MEL 650378). **TASMANIA:** Cape Barren Island, Furneaux Group, 5.xi.1973, *J.S. Whinray* 568 (MEL 533327); Flinders Island, Tanners Bay Tinfield, 27.x.1967, *J.S. Whinray* s.n. (MEL 1532017); 1 km W of Glenwood Plants turnoff, 4.xi.1990, *D.L. Jones* 6967 & *C.H. Broers* (HO 326145); Marsh west of Apsley River, 22.xi.1986, *P. Collier* 1892 (HO 119207); North of Southport Lagoon, 6.xii.1989, *P. Collier* 4433 (HO 119805); Picketts Plain, 13.xi.1983, *A. Moscal* 4019 (HO 101541); Flinders Island, xi.1912, *L. Rodway* s.n. (HO 99330); Rocky Cape, 30.x.1987, *R.J. Bates* s.n. (AD); Cape Barren Island, Furneaux Group, 24.x.1973, *J.S. Whinray* 133 (AD 97512292); East Coast, Dianas Basin, 6.xi.1880, *A. Simson* RSR4733 (AD 97721295).

Distribution and habitat: Southeastern Australia, but apparently rare in South Australia and New South Wales. Grows in open forest, woodlands, heathy woodlands and heathland on soils ranging from well-drained sand to peaty soils around swamp margins. Altitude: 0–300 m. (Fig. 2 c)

Conservation status: Widespread, common and well conserved.

Flowering period: September to November

Pollination biology: This species is entomophilous.

Typification: The type sheet contains four specimens with two labels, representing two separate collections. The three specimens on the left have Gunn's number 939, and were collected in November 1837 at Welcome River near Woolnorth in far north-western Tasmania. The single specimen on the right has Gunn's number 941, and was collected in December 1837 at Circular Head, Tasmania. All four specimens are of fairly uniform appearance, and both collections were cited by Lindley in the protologue. The three left hand specimens have been designated as the lectotype by an unknown worker *in sched.*, presumably as this is the larger collection and the first mentioned in the protologue. On the lower part of the sheet, near the three left hand specimens, there is a sketch of a column, apparently executed by Lindley. It is possibly the uncharacteristic appearance of the post-

anther lobe of the column in this rather rudimentary sketch that has lead to so much confusion regarding the identity of this species for more than 100 years.

Lindley's Latin description (Lindley 1840): *T. aristata*. *T. folio ensiformi canaliculato vaginisque acutissimis, spicâ multiflorâ, bracteis aristatis, cuculli laciniis lateralibus pedicellatis villosis intermediâ emarginatâ glanduloso-serratâ. (Thelymitra with leaf sword-like, channelled, and with the sheaths very acute, raceme many-flowered, bracts aristate, the lateral flaps of the hood pedicellate, woolly, column emarginate in the middle, glandular-serrate).*

Notes: Plants consistent with Lindley's description and notes on *T. aristata*, and with Gunn's collections 939 and 941 on the type sheet, are common in north-western Tasmania and have been collected recently and studied. This taxon is relatively common and widespread in southeastern Australia. *Thelymitra aristata* is closely related to *T. kangaloonica* but the latter species grows at higher altitude, is generally less robust with a smaller leaf, bracts and flowers. *Thelymitra aristata* is also closely related to *T. grandiflora* from South Australia and *T. silena* from Tasmania, but it differs from both in having generally darker blue flowers and a flatter, more strap-like post-anther lobe on the column. It also differs from *T. silena* in that the lateral lobes of the column are always well developed and have dense tufts of hairs.

Rare hybrids between *T. aristata* and *Thelymitra juncifolia* Lindl. have been collected near Rocky Cape in northern Tasmania, and between *T. aristata* and *T. ixioides* near Genoa in eastern Victoria.

4. *Thelymitra grandiflora* Fitzg., Gard. Chron. (new ser.) 17(433): 495 (1882).

Type: Mount Lofty, South Australia, x., *R.D. Fitzgerald* s.n. (lectotype 'A' BM!, *fide* J.Z. Weber 1990 *in sched.*; isolectotypes BM!).

Illustrations: Fitzgerald (1888) 2: 3; Bates & Weber (1990) plate 197 (as *T. aristata*); Jones (2006) page 239.

Glabrous terrestrial herb. Tubers ovoid, 1–4 cm long, 10–15 mm wide, fleshy. Leaf linear to linear-lanceolate, 10–40 cm long, 10–30 mm wide, erect, canaliculate, fleshy, dark green, often glaucous, with a green or purplish base, ribbed abaxially, sheathing at base, apex acute. Inflorescence 20–80(–100) cm tall.

Scape 2–8 mm diam., slender to stout, straight, green or purplish, often glaucous. *Sterile bracts* 2–4, linear to lanceolate, 3–15 cm long, 5–25 mm wide, closely sheathing, green or purplish, acute, lower ones leaf-like. *Fertile bracts* ovate-acuminate to obovate-acuminate, 7–35 mm long, 3–10 mm wide, closely sheathing the pedicel, green or purplish. *Pedicels* 4–15 mm long, slender. *Ovary* cylindric to narrowly obovoid, 7–12 mm long, 2–4 mm wide. *Flowers* 2–30, 20–40 mm across, more or less campanulate, usually blue, lilac, mauve or pale purplish, rarely pink, opening moderately freely in warm weather. *Perianth segments* 8–20 mm long, 4–10 mm wide, concave, shortly apiculate; *dorsal sepal* ovate to lanceolate, acute; *lateral sepals* ovate to lanceolate, slightly asymmetric, acute; *petals* ovate to lanceolate, acute; *labellum* ovate to lanceolate, acute, often narrower than other segments. *Column* erect from the end of ovary, 5–7 mm long, 2–3.5 mm wide, lilac, mauve or greenish; *post-anther lobe* not hooding the anther, 2.5–3 mm long, 2–3 mm wide; *post-anther lobe extension* 2–2.5 mm long, strap-like with a thick, fleshy base and often with decurved lateral margins, straight or gently curved, apex often variously bilobed, lobes toothed or incised, yellow with a brownish collar; *auxiliary lobes* absent; *lateral lobes* converging, 1.5–2.5 mm long, digitiform, obliquely erect, each with a terminal toothbrush-like arrangement of white hairs, the individual hairs 1.2–1.5 mm long. *Anther* inserted at base of column, mostly obscured behind stigma, ovoid, 1.8–2.6 mm long, 1.4–2.2 mm wide, warty, connective produced into an obtuse beak c. 0.4 mm long; *pollinarium* 1.5–2.2 mm long; *viscidium* circular to reniform, c. 0.5 mm long; *pollinia* coherent, white. *Stigma* situated at base of column, ovate-quadrate, 1.5–2.5 mm long, 1.5–2.5 mm wide, margins irregular. *Capsules* obovoid, 10–20 mm long, 5–6 mm wide, erect, ribbed. (Fig. 1 d, Fig. 6 a–c)

Selected specimens examined: **SOUTH AUSTRALIA:** Scotts Creek, Mt Lofty Ranges, 11.xi.1906, *R.S. Rogers s.n.* (MEL 2016025); Bugle Ranges (MEL 1549710); Flinders Ranges District: Alligator Gorge, Battery Range, 30.ix.1986, *M.A. Clements* 4312 (CANB 8605457); South Lofty District: Bradbury, 29.xii.1980, *M.A. Clements* 2265 (CANB B100017); Flinders Range District: Southern Flinders Range, near Alligator Gorge; along main ridge, 14.x.1968, *R. Nash s.n.* (CANB 8104435); Flinders Ranges District: Alligator Gorge, Battery Range, 30.ix.1986,

M.A. Clements 4312 (CANB 8605457); Lofty South District: S of Cherry Gardens, xi.1954, *R. Nash s.n.* (CANB B104566); Southern Lofty: Cleland Conservation Park, 24.x.1983, *P. Hornsby* 25 (AD 98538261); Southern Lofty: Myponga Conservation Park, 14.x.1986, *D.E. Murphet* 223 (AD 98650396); Southern Lofty: Mylor, 30.xii.1976, *R.J. Bates* 1151 (AD RJB1151); Flinders Ranges: Alligator Gorge, 27.ix.1988, *R.J. Bates* 15531 (AD 9920B02); Yorke Peninsula District: Stansbury, 18.ix.1976, *R.J. Bates s.n.* (AD RJBYP).

Distribution and habitat: Apparently endemic to South Australia, mostly in the Mount Lofty Ranges and Southern Flinders Ranges, but also recorded for the Yorke Peninsula and Kangaroo Island where possibly now extinct. Grows in open forest and scrubland, particularly in rocky places on hard clay or gravelly soils. Altitude: 5–600 m. (Fig. 2 d)

Conservation status: Reasonably widespread, localised but sometimes locally common and well conserved.

Flowering period: September to December.

Pollination biology: This species is entomophilous.

Typification: The typesheet contains three specimens with two labels, possibly all part of the same collection, but it is impossible to be sure. The specimen on the right (A) is associated with the main label giving the plant name, place of publication of the plant name, collection locality and month of collection. The two specimens on the left (B and C) are associated with a second label in the same hand giving just the plant name. Specimen A has been designated as the *Lectotype in sched.* by J.Z. Weber (1990), and specimens B and C as *Isolectotypes*. All three specimens are well preserved and are of the same species, specimen A being the most robust plant, but missing a small portion of the scape just below the inflorescence. Specimens B and C are virtually complete.

Notes: *Thelymitra grandiflora* differs from *T. aristata* and *T. kangaloonica* by its often lilac to pale purplish flowers and broader post-anther lobe that is thicker at the base, often has decurved lateral margins and is usually more obviously bilobed and toothed at the apex. *Thelymitra grandiflora* is also closely related to *T. silena* from Tasmania, but the latter has paler flowers, a more globose column post-anther lobe and shorter lateral lobes with fewer hairs.

5. *Thelymitra adorata* Jeanes, *sp. nov.*

Thelymitra aristata Lindl. *affinis anthera ad columnam prope medium affixa sub anthesi a stigma non obscurata, lobo post-antheram ad apicem profunde fisso marginibus lateralibus recurvioribus differt.*

Type: New South Wales. Wadalba, ix. 2001, B. Branwhite JAJ1030 (holotype MEL 2173020, isotype CANB).

Illustrations: Bell *et al.* (2005) front cover; Jones (2006) 238.

Glabrous terrestrial herb. Tubers not seen. Leaf linear to linear-lanceolate, 10–40 cm long, 5–20 mm wide, erect, canaliculate, fleshy, ribbed abaxially, green with a purplish base, sheathing at base, apex acute. Inflorescence 20–60 cm tall. Scape 2–5 mm diam.,

slender to stout, straight, green or purplish. Sterile bracts 2–4, linear to lanceolate, 2–13 cm long, 5–15 mm wide, closely sheathing, green and purplish, acute, lower ones leaf-like. Fertile bracts ovate-acuminate to obovate-acuminate, 6–22 mm long, 3–7 mm wide, closely sheathing the pedicel, green or purplish. Pedicels 1–14 mm long, slender. Ovary cylindric to narrowly obovoid, 3–12 mm long, 2–3.5 mm wide. Flowers 2–13, 15–27 mm across, opening moderately freely in warm weather. Perianth segments 8–13 mm long, 4–7 mm wide, often shortly apiculate, deep blue; dorsal sepal ovate to ovate-lanceolate, acute; lateral sepals ovate to ovate-lanceolate, often slightly asymmetric, acute; petals ovate to ovate-lanceolate, acute; labellum ovate-lanceolate to lanceolate, acute, often narrower than other segments. Column erect from the end of ovary,



Figure 3. a. *Thelymitra adorata*; b. *Thelymitra kangaloonica*; c. *Thelymitra planicola*. (photographs a. Stephen Bell, Eastcoast Flora Survey; b. Ron Tunstall; c. Jeff Jeanes, RBG Melbourne)

5.5–6.5 mm long, 2.5–3.5 mm wide, white to pale blue; *post-anther lobe* not hooding the anther, 2.5–3.5 mm long, 1.5–2.2 mm wide; *post-anther lobe extension* 1–1.5 mm long, more or less semicylindric, gently curved, dark brownish, apex yellow, distal margin irregularly toothed or incised, incurved, also with a narrow central notch or split 0.5–1 mm deep; *auxiliary lobes* absent; *lateral lobes* converging, 1.5–2 mm long, digitiform, porrect or obliquely erect, curved gently, each with a more or less terminal mop-like tuft of white hairs, the individual hairs 1–1.5 mm long. *Anther* inserted about mid-way along column, base partly obscured behind stigma, ovoid, 2–3 mm long, 1.5–2 mm wide, connective produced into a beak 0.4–0.6 mm long; *pollinarium* 1.5–2.5 mm long; *viscidium* circular to reniform, c. 0.6 mm diam.; *pollinia* white, friable, mealy. *Stigma* situated at base of column, ovate-quadrate, 2–2.5 mm long, 2–2.5 mm wide. *Capsules* obovoid, 10–20 mm long, 5–7 mm wide, erect, ribbed. (Fig. 3 a, Fig. 6 d–f)

Specimens examined: NEW SOUTH WALES: Warnervale, edge of Parters Creek wetland, ix.2001, B. Branwhite JAJ1033 (MEL 2172988); New South Wales, B. Branwhite ORG2759 (CANB 611001); Wadalba, 29.ix.1998, B. Branwhite ORG1571 (CANB 611789.3 p.p.)

Distribution and habitat: Apparently confined to the Central Coast (Harden 1993) of New South Wales in the vicinity of Gosford. Grows in grassy woodlands dominated by *Corymbia maculata* (Hook.) K.D. Hill & L.A.S. Johnson (Spotted Gum) with *Themeda triandra* Forssk. (Kangaroo Grass) understorey. Altitude: 10–40 m. (Fig. 4 a).

Conservation status: Known from only a few collections in the Gosford area and apparently extremely

rare. All known sites are subject to imminent or eventual housing developments. Other threats include habitat fragmentation, cattle and horse grazing, illegal collection and competition from invasive weeds (Bell *et al.* 2005). Suggest 2E by criteria of Briggs and Leigh (1996) and Endangered (E) by criteria of IUCN (2001).

Flowering period: September and October

Pollination biology: The pollination biology of this species is unknown, however the friable pollen and the very high degree of capsule development would suggest that it is probably autogamous.

Notes: *Thelymitra adorata* is closely related to *T. aristata* but the latter has a flatter, more strap-like post-anther lobe that lacks an obvious apical split and the anther is inserted more or less at the base of the column at anthesis and is mostly obscured behind the stigma. *Thelymitra planicola* is similar to *T. adorata* but the post-anther lobe of the former is more obviously semi-cylindric in shape, is entire to shallowly bilobed but not deeply split at the apex and does not extend as far beyond the point of insertion of the lateral lobes.

The introduced grass *Andropogon virginicus* L. (Whisky Grass) is a threat at one site.

Etymology: Latin *adoro*, to adore, to worship; the column in profile has been likened to a person in prayer.

6. *Thelymitra kangaloonica* Jeanes, *sp. nov.*

Thelymitra aristatae Lindl. *affinis in habitu graciliore, folio angustiore, floribus minoribus dehiscentibus tardioribus in tempore et in habitatione differt.*

Type: New South Wales. Central Tablelands: Tourist Road Swamp, near Robertson, 7 xi. 2001, D.L. Jones



Figure 4. Distributions of: a. *Thelymitra adorata*; b. *Thelymitra kangaloonica*; c. *Thelymitra planicola*

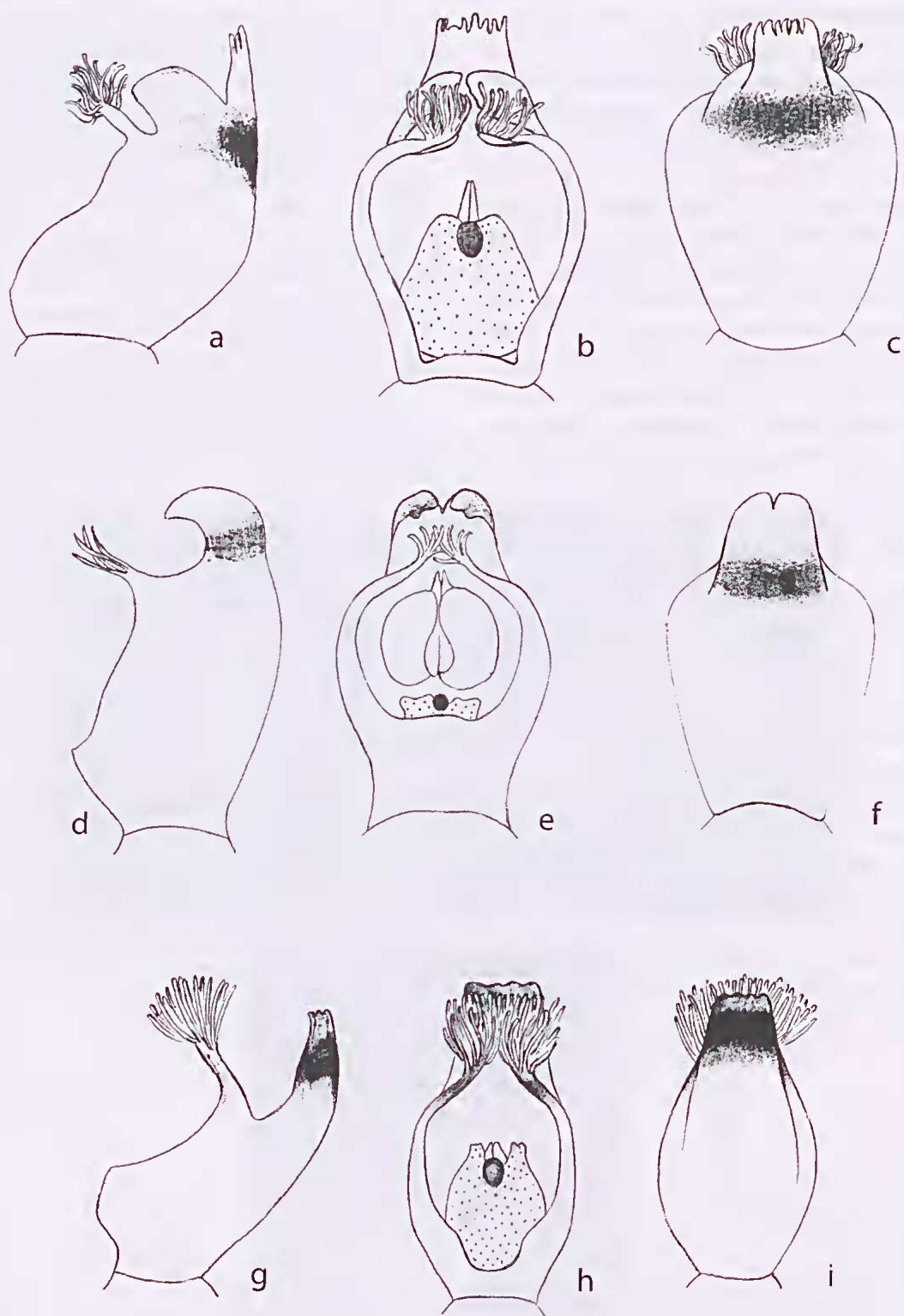


Figure 5. *Thelymitra epipactoides*: **a.** column from side $\times 6$; **b.** column from front $\times 6$; **c.** column from rear $\times 6$. *Thelymitra silena*: **d.** column from side $\times 6$; **e.** column from front $\times 6$; **f.** column from rear $\times 6$. *Thelymitra aristata*: **g.** column from side $\times 6$; **h.** column from front $\times 6$; **i.** column from rear $\times 6$

18108 (holotype CANB 633110; isotypes MEL 2172091, NSW, BRI).

Illustrations: Bishop (2000) plate 59 (as *T. aristata*); Jones (2006) 239.

Glabrous terrestrial *herb*. *Tubers* not seen. *Leaf* linear to linear-lanceolate, 10–35 cm long, 5–20 mm wide, erect, canaliculate, fleshy, green with a purplish base, ribbed abaxially, sheathing at base, apex acute. *Inflorescence* 20–56 cm tall. *Scape* 1.5–3.5 mm diam., straight, green or purplish. *Sterile bracts* usually 3, occasionally 2, linear to lanceolate, 1.5–11 cm long, 3–14 mm wide, green to purplish, lower ones closely sheathing and sometimes leaf-like, upper one usually only half encircling the scape and mostly free, acute to acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 6–20 mm long, 3–6 mm wide, closely sheathing the pedicel, green or purplish. *Pedicels* 2–10 mm long, slender. *Ovary* cylindric to narrowly obovoid, 6–11 mm long, 1.5–3 mm wide. *Flowers* 2–15, 15–32 mm across, dark blue with darker longitudinal veins, opening moderately freely in warm weather. *Perianth segments* 8–18 mm long, 4–8 mm wide, concave, shortly apiculate; *dorsal sepal* ovate, obtuse to subacute; *lateral sepals* ovate to lanceolate, slightly asymmetric, acute; *petals* ovate, obtuse to subacute; *labellum* ovate to lanceolate, acute, slightly smaller than other segments. *Column* erect from the end of ovary, 5.5–6.5 mm long, 2.5–3.5 mm wide, white to mauve; *post-anther lobe* not hooding the anther, 2–2.5 mm long, 1.5–2 mm wide; *post-anther lobe extension* 1.5–2 mm long, more or less flat, strap-like, gently curved, yellow with a dark purplish collar, apex decurved, often shallowly bilobed, lobes toothed or incised; *auxiliary lobes* absent; *lateral lobes* converging, 1.5–2.3 mm long, digitiform, obliquely erect, each with a more or less terminal short toothbrush-like tuft of white hairs, the individual hairs 1–1.6 mm long. *Anther* inserted at base of column, mostly obscured behind stigma, ovoid to almost spherical, 2–2.5 mm long, 1.7–2.2 mm wide, warty, connective produced into an obtuse beak to c. 0.3 mm long; *pollinarium* 1.7–2.2 mm long; *viscidium* circular to transverse-elliptic, 0.5–0.6 mm long, 0.6–0.8 mm wide; *pollinia* friable, mealy, white. *Stigma* situated at base of column, ovate-quadrate, 1.6–2 mm long, 1.8–2 mm wide, margins irregular, hardly bilobed at apex. *Capsules* obovoid, 8–12 mm long, 4–6 mm wide, erect, ribbed. (Fig. 3 b, Fig. 6 g–i)

Specimens examined: **NEW SOUTH WALES:** Central Coast: East Kangaloon, Molly Morgan Swamp, 9.xi.1969, *B. Whitehead* 2350, 2348, 2349, 2306 (CAN8 8104568, CAN8 8104431, CAN8 8104432 & CAN8 8104433); Central Coast: East Kangaloon, 16.xi.1970, *B. Whitehead* 2437 (CAN8 8104567); NE of East Kangaloon, 9.xi.1969, *B. Whitehead* s.n. (NSW 88618); Central Coast: Tourist Road, E of Bowral, 22.xi.1998, *M.A. Clements* 9805 (CAN8 611740); Central Tablelands: Fitzroy Falls, 15.xi.1992, *A.D. Bishop* J245/7-12 (NSW 430838); Central Coast: Robertson, swamp near Tourist Road, 22.x.1986, *R.G. Tunstall* 174 (CAN8 8605737).

Distribution and habitat: Apparently endemic to the Central Tablelands (Harden 1993) of New South Wales, in the Fitzroy Falls/Robertson/Kangaloon area. Grows in seasonally swampy sedgeland on grey silty clay loam. Altitude: 600–700 m. (Fig. 4 b)

Conservation status: Locally common, but with a very restricted range and probably endangered. Drying of its swampy habitat by a proposed borefield appears to be the main immediate threat facing this species. Suggest 2E by criteria of Briggs and Leigh (1996) and Endangered (E) by criteria of IUCN (2001).

Flowering period: Late October and November

Pollination biology: The friable, mealy pollen and the high degree of capsule development would suggest that this species is facultatively autogamous. The moderately large, freely opening flowers with a strong spicy fragrance and the functional viscidium indicate that this species is at least sometimes capable of entomophily.

Notes: *Thelymitra kangaloonica* is closely related to *T. aristata*, but the latter grows in lower altitude heathlands and heathy woodlands, is a generally more robust species often with a larger leaf, larger sterile and fertile bracts, longer pedicels and larger flowers that generally appear earlier in the season.

Etymology: From the township of Kangaloon in the Central Tablelands (Harden 1993) district of New South Wales. The type collection and most other preserved specimens came from this general area.

7. *Thelymitra planicola* Jeanes, *Muelleria* 14: 94 (2000).

Type: Victoria. Golden Beach. SE edge of Lake Reeve, c. 200 m NE of causeway and adjacent to rare plant reserve, 26 x. 1999, *J.A. Jeanes* 608 (holotype spirit MEL2069957!, isotypes MEL2069958!, CANB!).

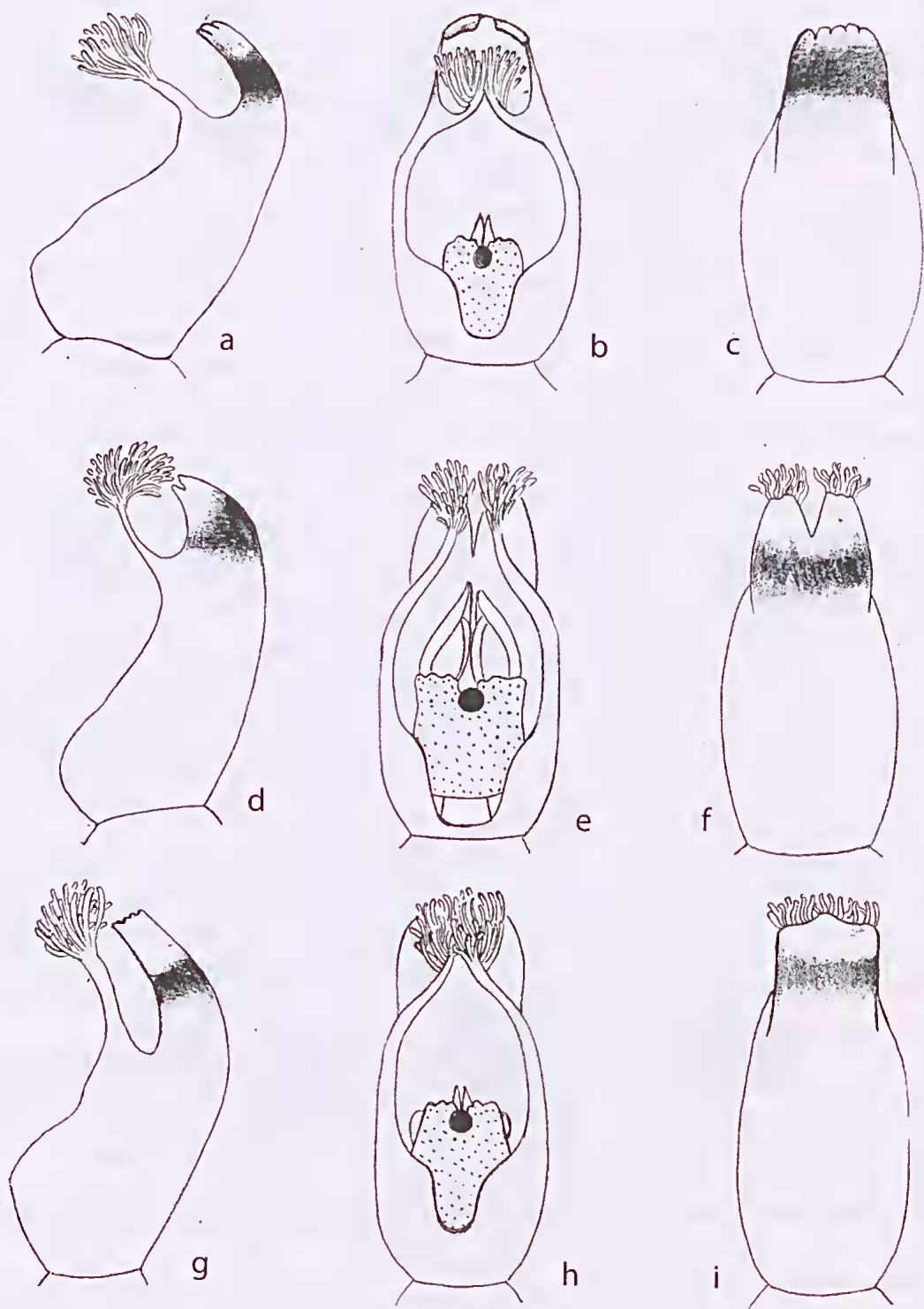


Figure 6. *Thelymitra grandiflora*: **a.** column from side $\times 8$; **b.** column from front $\times 8$; **c.** column from rear $\times 8$. *Thelymitra adorata*: **d.** column from side $\times 8$; **e.** column from front $\times 8$; **f.** column from rear $\times 8$. *Thelymitra kangaloonica*: **g.** column from side $\times 8$; **h.** column from front $\times 8$; **i.** column from rear $\times 8$

Illustrations: Jeanes (2000) fig. 1 e,f,g & h; fig. 5; Jeanes (2004) fig. 6 a,b & c; fig. 28; Jeanes & Backhouse (2006) page 206.

Glabrous, somewhat glaucous terrestrial herb. *Tubers* not seen. *Leaf* linear to linear-lanceolate, 10–30 cm long, 5–20 mm wide, erect, leathery, canaliculate, dark green with a purplish base, ribbed abaxially, sheathing at base, apex acute. *Inflorescence* 22–45 cm tall. *Scape* 2–5 mm diam., straight, purplish. *Sterile bracts* 2–4, linear to lanceolate, 2–8 cm long, 5–15 mm wide, green or purplish, lower ones often leaf-like, closely sheathing for most of their length, acute to acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 10–20 mm long, 4–8 mm wide, sheathing the pedicels green or purplish. *Pedicels* 1–8 mm long, stout. *Ovary* cylindric to narrow-obovoid, 3–12 mm long, 1.5–4 mm wide. *Flowers* 2–12, (15–)20–25(–30) mm across, medium blue with darker blue longitudinal veins, opening readily only on hot days. *Perianth segments* (7–)10–13(–15) mm long, 4–8 mm wide, concave, often shortly apiculate; *dorsal sepal* ovate to obovate, obtuse to subacute; *lateral sepals* ovate-lanceolate, slightly asymmetric, acute; *petals* ovate to obovate, obtuse to subacute; *labellum* oblanceolate to obovate, acute, often slightly smaller than other segments. *Column* erect from the end of ovary, 5–6 mm long, 3–4 mm wide, white to pale blue; *post-anther lobe* hooding the anther, 1.5–2 mm long, 1.5–2 mm wide; *post-anther lobe extension* 0.5–1.2 mm long, semi-cylindric, gently curved, mostly dark

blackish brown with a thin blue collar, apex shallowly bilobed, yellow, lobes shallowly and irregularly toothed; *auxiliary lobes* absent; *lateral lobes* converging, 1.2–2 mm long, digitiform to somewhat flattened, obliquely erect, curved, each with a short, terminal, mop-like arrangement of white hairs, the individual hairs 0.9–1.5 mm long. *Anther* inserted about mid-way along column, basal part obscured behind stigma, ovoid, 2.7–4 mm long, 1.5–2.2 mm wide, connective produced into a beak c. 0.5 mm long; *pollinarium* 1.5–2.2 mm long; *viscidium* circular, c. 0.5 mm diam.; *pollinia* friable, mealy, white. *Stigma* situated at base of column, more or less quadrate, 2–2.5 mm long, 2–2.5 mm wide, margins irregular. *Capsules* obovoid, 10–16 mm long, 3.5–7 mm wide, erect, ribbed. (Fig. 3 c, Fig. 7 a–c)

Specimens examined: **NEW SOUTH WALES:** Cultivated CANB ex Orient Point, E of Nowra, 4.xi.1988, D.L. Jones 3422 (CANB 8807085); Narrabeen, suburb of Sydney, 1.x.1954, A.W. Dockrill & B.B. Lowry 815 (AD 97631544); Kurnell, Botany Bay N.P., 25.ix.2005, D. Rouse 25/9a (MEL 2296310); Kurnell, Botany Bay N.P., 14.ix.2006, D. Rouse 14/9a (MEL 2296486). **VICTORIA:** Gippsland Lakes Reserve, 27.x.1984, A.C. Beaglehole 78814 & J.R. Turner (MEL 669448); Providence Ponds Flora and Fauna Reserve, 22.x.1984, A.C. Beaglehole 78729 (MEL 670413); Golden Beach, SE edge of Lake Reeve, 4.xi.1996, J.A. Jeanes 258 (MEL 2034950); Rail Reserve WSW of Lindenow South, 27.x.1999, J. Turner JAJ633 (MEL 2069954); Bairnsdale, 24.x.1987, R.J. Bates 11393 (CANB 478099 specimen 2); Marlo Airport, 15.xi.1987, R.J. Bates 12172 (AD 98753040); Howe Flat beside walking track to beach, 9.xi.2004, J.A. Jeanes 1443 (MEL 2265086, MEL 2265086); E side of Mallacoota Inlet, c. 5 km ENE

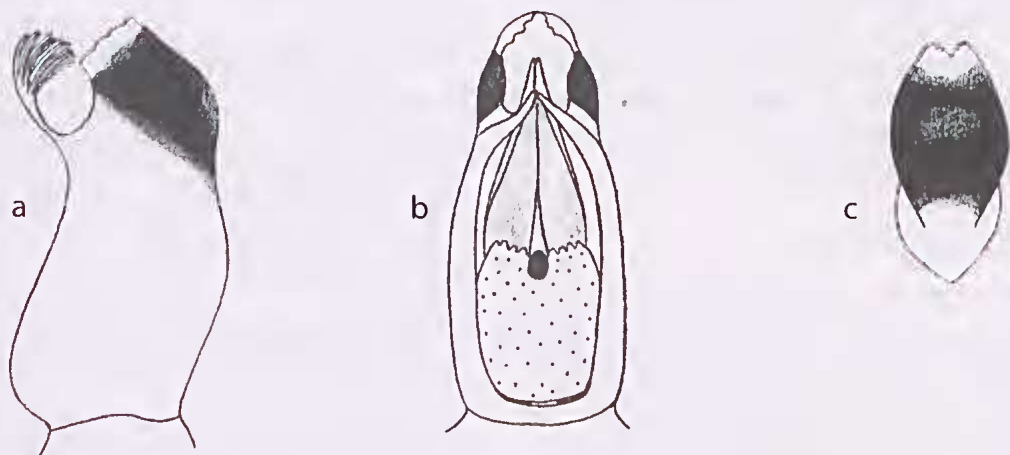


Figure 7. *Thelymitra planicola*: a. column from side $\times 8$; b. column from front $\times 8$; c. column from rear $\times 8$

of Mallacoota near the S end of Hawe Flat faat track, S.xi.2003, J. Eichler 194 (MEL 2224848, MEL 2219607).

Distribution and habitat: Eastern Victoria and the New South Wales Central Coast (Harden 1993). Most collections are from the eastern section of the Gippsland Plain Natural Region (Conn 1993), between Sale and Baimsdale, Victoria, with disjunct collections from near Marlo and Mallacoota and from New South Wales, east of Nowra and near Sydney. Grows in herb-rich grassland and grassy woodland and heathland on soils ranging from sandy loams to clay loams and also around swamp margins. Altitude: 0–80 m. (Fig. 4 c)

Conservation status: Known from only about ten colonies and very few plants. Suggest 3EC by criteria of Briggs and Leigh (1996) and Endangered (E) by criteria of IUCN (2001).

Flowering period: Late October to early November.

Pollination biology: The friable, mealy pollen and the high degree of capsule development would suggest that this species is facultatively autogamous.

Notes: The structure of the post-anther lobe of *T. planicola* is somewhat intermediate between that of *T. aristata* and of members of the *T. pauciflora* complex. This led to some early speculation about the possible hybrid origins of *T. planicola* (Jeanes 2000), but this appears unlikely as it favours a different habitat to that of *T. aristata* and the two have never been found growing sympatrically. In the past (Jeanes 2000, Jeanes 2004) I have treated *T. planicola* tentatively as a member of the *T. pauciflora* complex, but with its moderately tall habit, large fleshy leaf and the large leaf-like lower sterile bracts it would appear to fit more readily in the *T. aristata* complex. Also, the structure of the post-anther lobe extension is not typical of members of the *T. pauciflora* complex, but is rather like some members of the *T. aristata* complex, particularly the recently discovered *T. adorata* from New South Wales.

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